

12. (Amended) A battery according to claim 11, wherein the laminate is rolled up.

13. (Amended) A battery according to claim 11, wherein the laminate is folded.

(Please add new Claim 15 as follows:

--15. (New) A battery according to claim 1, wherein the adhesive resin is selected from the group consisting of polyvinylidene fluoride and polyvinyl alcohol.--

SUPPORT FOR THE AMENDMENTS

This Amendment amends the specification; amends Claim 1-13; and adds new Claim 15. Support for the amendments is found in the specification and claims as originally filed. In particular, support for the paragraph beginning at page 10, line 5, is found in the specification at page 10, line 8. Support for the paragraph beginning at page 36, line 13, is found in the specification at page 36, lines 20 and 25. Support for Claim 1 is found in Claim 1. (Note that the marked-up version of amended Claim 1, not the "clean version" of amended Claim 1, from the Amendment filed March 14, 2001, is herein being amended.) Claim 8 is rewritten in independent form. Support for new Claim 15 is found in the specification at least at page 14, lines 16-17. No new matter would be introduced by entry of these amendments.

Upon entry of these amendments, Claims 1-15 will be pending in this application. Claims 1 and 8 are independent.

REMARKS

Applicants respectfully request entry of the foregoing, and reexamination and reconsideration of the application, as amended, in light of the remarks that follow.

Applicants thank the Examiner for the indication that Claim 8 would be allowable if rewritten in independent form including all of the limitations of the base claims and any

intervening claims. Final Rejection at page 4, lines 15-18. Accordingly, Claim 8 is rewritten in independent form.

The Amendment filed March 14, 2001, is objected to under 35 U.S.C. §132 as introducing new matter into the disclosure. To obviate this objection, the paragraphs beginning at page 10, line 5, and at page 36, line 13, are amended. Thus, the objection should be withdrawn. Applicants respectfully request reconsideration and withdrawal of the objection.

Claims 1-7, 9-10 and 14 are rejected under 35 U.S.C. §102(e) over U.S. Patent No. 6,096,456 ("Takeuchi"). In addition, Claims 1-7 and 9-14 are rejected under 35 U.S.C. §103(a) over U.S. Patent No. 6,124,061 ("Hamano") in view of Takeuchi. Applicants respectfully traverse these rejections because the cited prior art fails to disclose, teach or suggest all the limitations of the claimed invention. In particular, the cited prior art fails to suggest the independent Claim 1 limitations of "an adhesive resin layer which is interposed in between the positive electrode and the negative electrode and is *joined directly to both* of the positive and the negative electrodes" where "the adhesive resin layer *consists of* one layer".

A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference. MPEP §2131. To establish a *prima facie* case of obviousness, the prior art reference (or references where combined) must teach or suggest all the claim limitations. MPEP §2143.

The present invention provides a light, compact and thin battery in which a positive and a negative electrode are joined firmly to maintain the adhesive strength while securing both electron insulation and ion conduction between electrodes and decreasing resistance between electrodes, i.e., internal resistance of a battery, to improve battery characteristics.

Specification at page 4, lines 8-15. The battery according to the invention comprises an

adhesive resin layer which is interposed in between the positive and negative electrode.

Specification at page 4, lines 17-21. The positive electrode and the negative electrodes are directly bonded to the adhesive resin layer. Specification at page 5, lines 1-2.

In contrast to the claimed invention, Takeuchi and Hamano both disclose batteries comprising the following five layer structure: positive electrode/ adhesive/ separator/ adhesive/ negative electrode. See, e.g., Takeuchi at column 25, lines 20-22; Hamano at abstract and Fig. 1.

However, the cited prior art fails to disclose, teach or suggest the three layer structure of the present invention shown as follows: positive electrode/ adhesive/ negative electrode. As a result, the cited prior art fails to disclose, teach or suggest the independent Claim 1 limitations of "an adhesive resin layer which is interposed in between the positive electrode and the negative electrode and is *joined directly* to *both* of the positive and the negative electrodes" where "the adhesive resin layer *consists of* one layer". Therefore, the various rejections under 35 U.S.C. §102(e) and §103(a) should be withdrawn. Applicants respectfully request reconsideration and withdrawal of the rejections.

Pursuant to M.P.E.P. §821.04, Applicants respectfully request examination of new method Claim 14, which includes all of the limitations of product Claim 1.

In view of the foregoing amendments and remarks, Applicants respectfully submit that the application is in condition for allowance. Applicants respectfully request favorable consideration and prompt allowance of the application.

Should the Examiner believe that anything further is necessary in order to place the application in even better condition for allowance, the Examiner is invited to contact Applicants' undersigned attorney at the telephone number listed below.

Respectfully submitted,

OBLON, SPIVAK, McCLELLAND,
MAIER & NEUSTADT, P.C.

Corwin Paul Umbach

Norman F. Oblon
Attorney of Record
Registration No. 24,618

Corwin P. Umbach, Ph.D.
Registration No. 40,211

Attachment:

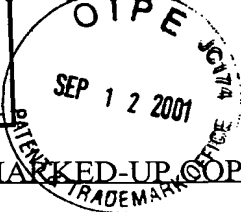
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Tel. (703) 413-3000
Fax. (703) 413-2220
NFO:CPU

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IN RE APPLICATION OF: :
SHIGERU AIHARA ET AL : EXAMINER: DOVE, T.
SERIAL NO: 09/381,295 :
FILED: SEPTEMBER 22, 1999 : GROUP ART UNIT: 1745

FOR: BATTERY

AMENDMENT AFTER FINAL REJECTION

ASSISTANT COMMISSIONER FOR PATENTS
WASHINGTON, D.C. 20231

SIR:

In response to the Final Rejection mailed May 22, 2001, please amend the application identified above as follows (marked-up copy of amendments attached):

IN THE SPECIFICATION

Please amend the specification as follows:

Paragraph beginning at page 10, line 5:

(Two Times Amended) The average particle size of the filler to be added is preferably not greater than that of the electrode active material, particularly 1 μm or smaller. Filler particles having an average particle size of [greater than] 1 μm ~~or greater~~ form pores the diameter of which approximates the pore size of the electrode, and the ability of holding the electrolytic solution decreases. Where filler particles have an average particle size equal to or greater than the particle size of the electrode active material, the pores lose the ability of holding the electrolyte, resulting in reductions of battery characteristics. That is, the filler added produces no substantial effect.

The sedimentation velocity of the filler particles in the adhesive resin solution increases with an increasing average particle size, which considerably deteriorates the handling properties of the adhesive resin solution. With the average particle size being 1 μm or smaller, the filler moderately increases the viscosity of the adhesive resin solution and makes the adhesive resin layer porous. The adhesive resin solution and the electrolytic solution can thus be held in the interface between electrodes.

Paragraph beginning at page 36, line 13 from the bottom:

(Two Times Amended) Table 3 shows the results obtained when the ratio of the alumina filler to the adhesive resin was varied. These results are graphed in Fig. 6, in which the peel strength and the battery capacity are plotted against volume percentage of the voids. The proportion of the adhesive resin in the void volume formed by the filler changes with a change of the filler to resin ratio, and a change of the void volume in the adhesive resin layer follows. If the volume percentage of the voids is [less than] 20% ~~or less~~, passages for ions through the adhesive resin layer are diminished, resulting in an obvious reduction in discharge capacity. On the other hand, the adhesive strength tends to reduce with an increase of volume percentage of the voids. If the volume percentage of the voids is [more than] 80% ~~or more~~, the amount of the filler is so large that the amount of the adhesive resin is insufficient, resulting in an extreme reduction in adhesive strength.

IN THE CLAIMS

Please amend Claims 1-13 as follows:

1. (Two Times Amended) A battery comprising a battery body including:
a positive and a negative electrode containing an active material,
an electrolytic solution containing an electrolyte, and
an adhesive resin layer which is interposed in between the positive electrode and the negative electrode and is joined directly to both of the positive and the negative electrodes,
wherein

the adhesive resin layer [comprises at least] consists of one layer and contains [fillers ;]
an adhesive resin and a filler.

2. (Amended) A battery according to claim 1, wherein [said] ~~the~~ electrolyte is an organic electrolyte containing lithium ions.

3. (Amended) A battery according to claim 1, wherein [the] an average particle size of [said] ~~the~~ filler is equal to or smaller than [the] a particle size of the active material constituting each electrode.

4. (Amended) A battery according to claim 1, wherein [said] an average particle size of [said] ~~the~~ filler is 1 μm or smaller.

5. (Amended) A battery according to claim 1, wherein the sum of a volume ratio of the adhesive resin and that of the filler per unit volume of [said] ~~the~~ adhesive resin layer is less than 1.

6. (Amended) A battery according to claim 1, wherein the sum of a volume ratio of the adhesive resin and that of the filler per unit volume of [said] ~~the~~ adhesive resin layer is 0.2 to 0.8.

7. (Amended) A battery according to claim 1, wherein [said] ~~the~~ filler comprises at least one of non-conductive materials and semiconductors.

8. (Amended) A battery [according to claim 1, wherein said] comprising a battery body including:

a positive and a negative electrode containing an active material,

an electrolytic solution containing an electrolyte, and

an adhesive resin layer which is interposed in between the positive electrode and the negative electrode and is joined directly to both of the positive and the negative electrodes,
wherein

the adhesive resin layer comprises at least one layer and contains fillers; and

the adhesive resin layer comprises a layer containing an electrically conductive filler and a layer containing at least one of non-conductive fillers and semiconductive fillers.

9. (Amended) A battery according to claim 1, wherein [said] the adhesive layer is constituted so as to fill the unevenness of the positive electrode and the negative electrode.

10. (Amended) A battery according to claim 1, wherein [said] the battery body is a laminate of a plurality of electrode bodies each [composed] consisting of [a single layer of] the positive electrode, [a single layer of] the adhesive resin layer, and [a single layer of] the negative electrode.

11. (Amended) A battery according to claim 10, wherein [said]

the laminate [is composed] of a plurality of electrode bodies comprises a plurality of positive electrodes, a plurality of negative electrodes and a plurality of adhesive resin layers; and

the plurality of positive electrodes and the plurality of negative electrodes are interposed alternately among [a] the plurality of [the] adhesive resin layers.

12. (Amended) A battery according to claim [10] 11, wherein [said] the laminate is [composed of the positive electrode and the negative electrode which are alternately interposed between adhesive resin layers and] rolled up.

13. (Amended) A battery according to claim [10] 11, wherein [said] the laminate is [composed of the positive electrode and the negative electrode which are alternately interposed between adhesive resin layers and] folded.

Please add new Claim 15 as follows:

--15. (New) A battery according to claim 1, wherein the adhesive resin is selected from the group consisting of polyvinylidene fluoride and polyvinyl alcohol.--